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The Hamlet dilemma for aluminium cans in the circular economy: to be or not to be in a closed loop?

Monia Niero*[1], Simon B. Hoffmeyer[2], Håkon Langen[2], Stig I. Olsen[1]

1: DTU Management; 2: Carlsberg Breweries A/S

*Corresponding author email: monni@dtu.dk

The aim of this work is to show how the Cradle to Cradle® (C2C) design framework [1] can inspire Life Cycle Assessment (LCA) in considering the multiple future uses of resources in continuous loops for beverage packaging, e.g. aluminium cans. The C2C design framework inspired the creation of the Carlsberg Circular Community, a cooperation platform launched in January 2014 featuring Carlsberg Group, the fourth largest global brewer in the world, and a selection of global partners with the ultimate aim to eliminate the concept of waste by rethinking the design of packaging, including the aluminium can [2].

In its current status the Life Cycle Inventory (LCI) modelling of aluminium processes is based on a pure aluminium flow, neglecting the presence of alloying elements [3]. However, within the circular economy context, the C2C vision calls for improving the quality and value of materials, through a characterization of chemicals included in the products and the development of an optimization strategy [1].

In this study, we focused on aluminium cans, which are made of two parts: the can body (typically A3004 alloy) and the lid (typically 5182 alloy). We quantified the influence of alloying elements on the overall environmental performances of aluminium can recycling and performed a LCA comparing different sources of aluminium: primary aluminium and mixed scraps, Used Beverage Can (UBC) scrap, mixed aluminium packaging scrap and building scrap [4]. The LCA results showed that the lowest environmental impacts come from the use of UBC scrap [5]. This suggests that in a circular economy context for aluminium cans it is better to be in a closed product loop.

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